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EDITORIAL NOTES

THE QUESTION OF PERSONNEL

SINCE the war the output of the Gas Industry has gone up by 16%, and this implies a much higher increase in many individual works. In the same period and for obvious reasons labour input has steadily deteriorated in quantity and quality. Coupled with this is the general condition of manufacturing plant, which in many cases is crying out for repair. Management is hardly a bed of roses, and the lot of the foreman or works superintendent is not an easy one. We do not, we think, hear enough about the work of the foreman, who, as every gas engineer knows, occupies a highly important if not entirely enviable position, acting as a link and a buffer between management and men, carrying out a very wide variety of duties. The smooth running of a works depends largely on the personality of the foreman, who must have intangible qualities other than the more readily assessed technical and mechanical qualifications.

This question of personnel was discussed helpfully and with acuity in a recent Address by Mr. John Bateman, of Sheffield, which we published in the "JOURNAL" of April 26. His comments were the outcome of direct experience and were very much to the point, and regarding the labour position his remarks were illuminating. During the past twelve months the Labour Exchange sent to the works of which Mr. Bateman is in charge 107 men. Of these, 39 were engaged. Only 24 are still employed, and only 8 have proved suitable for retort house jobs—a matter of 8% at a time of serious shortage and when allowances are made for the fact. That in spite of all this the output of the works has constantly increased to meet demand says a very great deal for organization and understanding of the worker. The Author set out briefly ways in which the relations between management and men have been improved, and explained how this improvement has reduced absenteeism to a figure over the last twelve months of less than 1% of the total men employed.

From consideration of the man-power problems of 1944, Mr. Bateman turned in the concluding part of his Address to a few general aspects, asserting *en passant* that company employees work harder than their counterpart in municipal service, and that this refers not only to manual workers. This considered opinion, by the way, is based on the Author's experience of both company and municipal service. While refraining from comment on this outspoken observation, we entirely endorse Mr. Bateman's contention that for the future the Gas Industry must concentrate on efficiency, and so provide a stimulant to industry in the form of reliable and economical heat service. It is not our duty to create unproductive work for the local unemployed but, by encouraging local industry, to assist in creating employment. We want more skilled and semi-skilled workers rather than the general labourer class in the future. The Gas Industry offers security of employment, and there ought not to be undue difficulty in building up that type of trained staff which will ensure a higher standard of efficiency. Improved working conditions and the provision of reasonable amenities and facilities will become factors of greater importance; but—we quote the Author's final remark—"we must not lose sight of the fact that the primary purpose a man is employed for is to work. A fair day's work in return for a fair wage."

THE PORTAL PRIORITY HOUSE

ON a later page we give a brief description of the first model of the Government's pre-fabricated all-steel emergency house, which seems to us a very good example of planning based, not on fanciful dreams, but on stern reality. What in fact has been achieved by way of comfort, amenity, and almost labourless equipment within an area totalling only 616 sq. ft. is amazing, and is vindication of skilled and imaginative planning of a thoroughly practical nature. The recipe consists of five tons of steel and half a ton of timber—all very simple. Obviously with a temporary structure of the kind there is nothing to be said usefully about its external appearance; one reserves comment till one has passed its portal, having done which there is revelation in planning. We have never seen space divided with such cunning and economy. However, we will not dilate on this; it is with the equipment that we are primarily concerned, and it is no small feat that our Industry has been able to adjust itself so readily to unusual circumstances, so that gas and coke take their place, as to the manner born, in this unorthodox emergency dwelling. Heating is central by one solid fuel appliance which also serves for water heating; cooking, refrigeration and laundry are by gas. The dwelling is insulated throughout.

The unit fittings for the various domestic services provide the most striking feature. They constitute roughly one-fifth of the cost of the dwelling (estimated at about £550), and as Lord Portal said in the House of Lords, "whatever else we shall accomplish by the manufacture of these houses we shall have helped to initiate and popularize the types of fitting which should in time be incorporated in all the permanent houses in this country." Essentially the houses will be "stop-gap" homes, but they will offer better amenities than those at present available to nine families out of ten in rural areas. The factory-made dwellings are intended primarily for newly-married couples; they will be publicly owned and licensed for a period. The plan is that a month of inspection of the model, providing for criticism and suggestion, shall be followed by about six months to arrange for the necessary jigs and tools for production. After that, everything depends on the course of the war. When the word go is given, it will, it is estimated, take about three months to work up to full production—something in the neighbourhood of 2,500 houses a week. There cannot, of course, be anything precise about this, but at any rate many thousands will be assured of a key to their own front door, if not back door, and many thousands of young women can look forward to an easily-run and economically-run home which will not weary them by over-fatigue and financial anxiety before their time.

OIL FROM COAL

WE enjoyed listening last Friday evening to the first Stevens Memorial Lecture given to the Junior Institution of Engineers by Dr. J. G. King, Director of the Gas Research Board. The object of the series of annual lectures is to cover the general subject of the better utilization of coal for the production of oil and petrol, and Dr. King was asked to help to organize the series. The opening lecture was a general survey of the whole field, and included not only those products of coal which are indeed oils, but the products of carbonization of coal which replace, or which can replace, liquid fuels, and Dr. King expressed the opinion that after the war the demand for fluid forms of heat from the carbonizing industries, and for smokeless solid fuels, will show considerable expansion. The prospects of the Gas Industry, he suggested, may well alter to meet this demand, and the by-products may not be tar and benzole as we know them to-day. Alternatively, processes of secondary treatment such as hydrogenation may absorb all the crude products not required for chemical industry, and market only refined oils and finished chemicals. He also hinted at the replacement of the gas oil used by the Industry by products derived from coal—active carbon for benzole recovery and methane as an enriching agent. The lecture, which was comprehensive, presented a most useful picture and will constitute a most valuable record—all the more helpful in that it was addressed to a professional body unconnected directly with the carbonizing and other coal treatment industries.

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Institution Meeting Cancelled

As we go to press, we learn that the Council of the Institution of Gas Engineers, after careful consideration at a meeting on May 9 of the current war situation, decided with regret to cancel the provisional arrangements made for the Annual General Meeting to be held in Edinburgh in June.

Personal

Mr. J. H. KEMP, Chairman of Fletcher, Russell & Co., Ltd. (Radiation Ltd.), was presented recently with an engraved silver tray with silver tea service by the Directors and employees and the members of the Recreation Club. The presentation was made by Mr. J. R. Walker, Director, in recognition of 55 years' active service in the interests of the firm, and marked the semi-retirement of Mr. Kemp. Mr. W. D. King, Director, made a presentation on behalf of the Board of Directors, while Mr. A. O. Russell, Director, presented a vinedish as a gift to Mrs. Kemp. The Sales representatives made a presentation of a silver cigarette box.

Although Mr. Kemp is retiring from active participation in the affairs of the Company, his many friends will be pleased to know that he is still retaining the Chairmanship, and will frequently be available at the Works. Many spoke on the occasion of the presentation, and each expressed the very high regard which they had for Mr. Kemp. The semi-retirement of Mr. Kemp has been received with mixed feelings by everyone concerned, and all wish him many years of good health in which to enjoy his well-earned leisure.

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Mr. C. A. H. FAIRBANK, a member of the staff of Richmonds Gas Stove Co., Ltd. (Rādiation Ltd.) has recently been appointed General Manager of George Glovers, of Chelsea. Mr. Fairbank is a Territorial with service in the last war, and in August, 1939, was a Brevet-Colonel in command of an Anti-Aircraft Regiment. He received promotion to the rank of Brigadier and took part in the fighting in North Africa, commanding an A.A. Brigade with the assault force. He returned to this country last June, being mentioned in despatches for his services, and subsequently returned to the Company's service.

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Mr. N. G. APPLEYARD, assistant to Mr. C. S. Shapley, has been appointed to the new post of Assistant Engineer and General Manager to the Leeds Gas Department.

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Mr. J. G. TILLEY, Deputy Engineer and Manager to the Macclesfield Gas Company, has been appointed Engineer and Manager to the Brighouse Gas Department in succession to Mr. J. Corrigan.

Obituary

The death has occurred of Mr. FRANK OSMOND, Director and Engineer and Manager of the Dorchester Gas and Coke Company, Ltd., for many years, at the age of 79. He started as junior clerk when he was 16, and on the death of his father in 1887, who had been Manager of the Company from 1862, he was appointed Engineer and Manager. When he retired in 1935 he was elected to a seat on the Board. Soon after the outbreak of the present war he resumed duty as Acting Engineer in the place of Lieut. R. Morton, R.N.V.R., who lost his life on active service, and he continued in that capacity till March 31 last, when he was succeeded by Mr. H. A. Cole.

Letter to the Editor

District Heating Schemes

DEAR SIR,—Your leading article on this subject on May 3 deals with a number of points within small compass and is timely. May I add three comments:

1. It is desirable to take any practicable steps to raise the low thermal efficiency of electricity generation. The district heating schemes now being discussed are less concerned with this aim than with the building of new "combined stations." These would add to our kW. capacity after the war when the problem may be to find markets for the surplus due to the relaxation of war production. If only 10% of the domestic and quasi-domestic heat needs of the country were supplied by steam or hot water from such stations the parallel increase in electricity output might be 50% over present electricity sales for all purposes (and would probably require even greater increase in kW. capacity owing to adverse load factor).

2. House-heating experience in U.S.A. and U.S.S.R. is an unreliable guide for use in Great Britain owing to contrasts in climate. Our weather is notoriously fluctuating, both from day to day and from year to year. This dictates a high degree of flexibility in our house-heating equipment if economy and comfort are to be achieved, and a high proportion of assured revenue from other loads if a district heating scheme is to undertake house heating without financial embarrassment when the winter is mild and the demand falls below estimate.

3. Gas and electricity supplies are themselves well-tried systems of "district heating," having substantial advantages for many purposes over steam or hot water. The higher the consumption per consumer the lower tends to be the proportionate cost, and *vice versa*. Both gas and electricity are essential in the home and factory. Gas cannot satisfactorily perform some of the functions of electricity; electricity cannot meet the bulk of the demand for heat in displacement of solid fuel at as low a price as can gas. The general introduction of steam or hot-water supplies, by contrasting the potential field for each service, would tend to raise the cost of all. In the interest of the user and the nation our aim should be to reduce the cost of efficient labour-saving heat services.

These comments are not intended to disparage the conversion to use of heat now wasted in electricity generation. In amount it may equal that which the Gas Industry provides to the community as coke, and, pending higher generation efficiencies, its continued loss is a sad extravagance. Surely its appropriate market is within those industries which are located near the generating stations, and which are able to take heat supplies as dictated by the electricity demand on the generating stations. Such a development appears an overdue measure of true fuel conservation, in contrast to the proposed embarking of vast sums to provide an additional fuel service of unproven merit for general purposes matched by additional electricity output for which no market is established. Unless objective consideration and effective co-ordination can be introduced by some such body as the proposed National Fuel Advisory Council, the past negligence of district heating technique may in future be matched by irresponsible development. This would lead to a period of disillusionment over ill-advised schemes and seriously prejudice desirable progress.

Wimbledon. Yours faithfully,
May 6, 1944. C. A. MASTERMAN.

North of England Association

There was a good attendance at the annual meeting of the North of England Gas Managers' Association in Newcastle on May 4. Mr. J. W. Pallister, of Middlesbrough, the President, was in the chair, and he referred to the death of three members since their last meeting. Mr. Herbert Lees, of Hexham, said the President, had been an honorary member of the Association. He had been a member for close on 60 years and had been President in 1895. Thirty-one years later the Association paid Mr. Lees the compliment of again electing him President in the Association's jubilee year—1926. Throughout the greater part of his membership he had taken an active part in the work of the Association. Mr. F. Hornby, of the Guisborough Gas Company, had not been in the North-East area for many years. Mr. R. F. Harbottle, of Newcastle, was an associate member.

The Secretary and Treasurer, Mr. H. D. Lees, of Hexham, submitted the annual financial statement.

The following members and associates were elected: Mr. P. S. R. Gordon, of Guisborough; transfer from associate to member, Mr. J. E. McManus, Newcastle; Associates, Mr. F. J. J. Brown, Mr. J. R. Lamb, and Mr. G. W. L. Simon, all of Newcastle.

Mr. Pallister then gave his Presidential Address—see later pages.

Mr. F. L. Scaife, of Stockton, proposed a vote of thanks to the President for his Address, and Mr. C. C. Walmsley seconded.

Mr. H. Douglas Lees, the new President of the Association, presented a certificate to Mr. Pallister to commemorate the latter's year of office.

Welcoming Mr. Lees into the Presidential office, Mr. Pallister said that for the past 14 years Mr. Lees had guided the Association most efficiently as its Secretary, and his election as President was a most deserved honour.

Mr. Lees thanked the members for the honour conferred on him, and said it was, for him, marred only by the fact that his father had not survived to see it conferred upon him.

Other officers elected for the ensuing year were:

Vice-President.—E. Crowther, Secretary and General Manager, Newcastle and Gateshead Gas Company.

Committee.—J. B. Henderson, Newcastle; A. L. Higham, Hull; T. Tarn, Darlington.

Hon. Secretary and Treasurer.—A. S. Middleton, Durham.

Hon. Auditor.—A. G. I. Anderson, Shotley Bridge.

Representative on the Council of The Institution of Gas Engineers: F. L. Scaife, Stockton.

North of England Gas Managers' Association and Arthur Clement Hovey Educational Trust Advisory Committee: J. M. A. Mitchell, Newcastle; J. W. Pallister, Middlesbrough.

Institution of Gas Engineers Education Scheme, Northern District Committee: A. E. Ruffhead, Darlington; E. Crowther, Newcastle; R. H. Duxbury, South Bank; J. M. A. Mitchell, Newcastle.

Mr. A. E. Ruffhead proposed a vote of thanks to the President, Secretary, and Committee for their services during the past year.

It was decided that as a memorial to the late Mr. H. Lees, a Herbert Lees Memorial Medal be instituted to be awarded for the best Paper given before the Association and the Auxiliary Section as the Committee might decide.

Mr. F. Nicol, Newcastle, gave notice of raising the question of an alteration to Rule 3*a* at the next meeting, whereby chemists be admitted as members of the Association more readily than existing rules permitted.

Primitiva Gas Company

The full text of the expropriation decree issued by the Argentine Government for the taking over of the assets of the Primitiva Gas Company of Buenos Aires has now been received by the Board. In the preamble a municipal ordinance is quoted which, in granting the current extension of the Company's contract, ordered that it should remove all its installations on municipal property on receiving notice to that effect. The preamble adds that certain essential properties can now be used temporarily by the Y.P.F. The legality of the provision regarding the removal of installations is contested by the company. The decree itself declares that substantially all the assets of the Company are of public utility and subject to expropriation. It authorizes the Ministry of Agriculture (which is responsible for the administration of the State Oilfields Monopoly, commonly known as the Y.P.F.) to offer 3,758,740 Argentine pesos in payment for these assets, and directs that if the offer is refused this sum shall be deposited to the order of the Federal Judge. It lays down that the State shall take over the assets described, through the Y.P.F., which is charged with the task of obviating any interruption in the service.

In a statement to stockholders the Directors explain that expropriation will follow the procedure laid down under the constitution and the pertinent laws, and that the amount to be paid to the Company will be established by the supreme court on the basis of a valuation by experts. The local committee has challenged the right of the authorities to require the withdrawal of the Company's installations, and consequently will oppose the taking over of the assets.

An official statement issued in Buenos Aires on the Company's behalf puts the value of the assets at 58,506,890 pesos. Deducting the Argentine Government's figure of 15,442,839 pesos for the cost of removing the installations, the net value now claimed by the Company is 43,064,051 pesos (about £2,800,000), compared with the £230,000 offered by the authorities.

In reply to representations addressed to him by the local committee of the Company, the Argentine Minister of Agriculture said his Government would respect the shareholders' rights. Expropriation procedure had been chosen so that impartial judges should determine the definite value of the assets to be expropriated. He gave an assurance that the Company would be granted every facility to state and defend its case.

Over 99% of the shares of the Primitiva Gas Company are now held by Primitiva Holdings, Ltd., and by an associated company of the Cia. Hispano-Americana de Electricidad.

The Portal Priority House

We had the opportunity last week of inspecting in London the first model of the Government's prefabricated steel house and were most impressed by the ingenuity of the planning, which, by avoiding corridors, gives maximum areas to rooms, and by the excellent and very practical equipment for cooking, laundry, and heating and cooling. The accommodation consists of a living room (145 sq. ft.), two bedrooms (each 125 sq. ft.), kitchen, bathroom, separate w.c., and shed—the whole contained in an area of 616 sq. ft.

Opening off the entrance hall are the kitchen, bathroom, and w.c. Two bedrooms open off the kitchen and living room respectively. The living room and kitchen are *en suite*, separated by a glazed screen, in the centre of which is a glazed door. The shed has access from the rear.

The partitions between the kitchen and bedroom and the living room and bedroom are arranged as two cupboard units. These provide on the kitchen side a larder with divided horizontal shelves, the lower portion intended for dry goods and the upper ventilated to the outside air for the storage of perishable foods. The second cupboard on the kitchen side is for crockery, brooms, and other kitchen requirements. Between these two cupboards is a hinged table, folding vertically when not in use against the partitions. All the cupboards on the kitchen side are in steel.

On the bedroom side of this cupboard unit are a full-height hanging wardrobe cupboard and another short cupboard, shelved for containing linen. The bedroom side of this unit has plywood panels to the doors, but all framing and shelving is in steel.

The cupboard unit between the living room and bedroom is in steel with plywood panels to the fronts. On the living-room side is a shelved china cupboard with three drawers under, and on the bedroom side are three cupboards, adequately shelved.

On the kitchen side are a combined assembled gas cooker, sink, and gas refrigerator, with doors and cupboards, and on the bathroom side the bath and combined clothes-washing boiler and hand washing bowl—all built into a steel unit. The hot and cold water pipes and waste pipes are in the middle of this unit, together with hot-water circulating cistern. The water is heated from a boiler at the back of the living-room open heating stove, of a new type for burning coke or anthracite, connected to the hot-water circulating cistern. An electric immersion heater, thermostatically controlled, is fixed in the cistern to heat about seven gallons of water for sink use when the living-room fire is not in use. The living-room fire will serve for providing hot air to the two bedrooms through steel ducts.

The construction is based on a factory-made job. The floors, which are in sections, are formed of sheet steel joists to which wood flooring is directly screwed. The walls are in panels of equal widths (except at the corners) into which are built steel windows. The walls are clad externally with sheet steel, and coated with flocculent anti-drum material on the inside. Internally the wall is lined with steel in the kitchen, bathroom, w.c. and hall, and elsewhere designed to receive plyboard or other similar wall lining. Within the external wall thickness is fixed faced aluminium foil on paper. Above the steel ceiling is placed aluminium foil mounted on timber frames. The roof is of steel, primed and tar sanded externally.

Prior to delivery of the emergency factory-made house, a concrete slab is laid and tarred on the top surface, and the necessary services and drains are put in. Afterwards the floor sections are laid and bolted together on top of the concrete, and the end walls and side walls are positioned, wedged and bolted, working from one end of the structure. The partitions, cupboards and kitchen units are placed in position before the walls are erected. The placing of the roof, bearing on the outer walls and the internal central spine wall, is the last constructional operation.

Editorial comment appears on an earlier page.

Psychology in Practice

On May 3 members of the Eastern District of the Southern Association of Gas Engineers and Managers were addressed by Mr. C. B. Frisby, Director of the Institute of Industrial Psychology, his subject being the practical application of psychology in industry. The talk was followed by a discussion which never showed signs of flagging. Mr. F. Dawson, Chairman of the District, presided.

Among the topics dealt with was the question of selection of personnel and the avoidance of endeavouring to fit square pegs into round holes. Reference was made to the large intake by the Gas Industry of apprentice fitters, one of the members outlining his undertaking's scheme, explaining that boys were in the first place taken on a six-months' trial basis, and that after this period, even if some of the entrants were not up to standard, sympathy was shown to them by the undertaking, and there was not in fact any very drastic weeding-out. On which point the lecturer suggested that it was no use retaining a boy if it was shown that there was little likelihood of his doing a good job of work. It merely resulted in wasting the boy's life and saddling the undertaking with an unsatisfactory craftsman. And at the age of, say, fourteen, there were so many boys and girls who simply did not know what they were in for when starting a job—they had no knowledge and understanding of what the job entailed. It followed that there should be an extension of the education system so that a boy or a girl could be guided about a suitable career. To-day, satisfactory vocational guidance was lacking. What was needed was a comprehensive report from the school, and while at school the student should be given information of what particular lines of work entailed in actual practice. Early education should not have a vocational bias, and the employer should recognize more fully his responsibility in the matter.

A member asked Mr. Frisby's views on the value of co-partnership, which, he thought, had, apart from financial attractions to the worker, values which, though intangible, were none the less important. The lecturer said he considered that the financial incentive which co-partnership offered was not in itself very great. Why co-partnership worked well in the Gas Industry was that the Industry was able to give what might be termed a semi-permanent form of employment which many other industries could not give.

Another member expressed the opinion that in the future, as the outcome of further specialization and mechanization, work would tend to become more monotonous. Would workers be so willing to take on jobs of ever increasing monotony? To which the lecturer replied that not every worker objected to monotony. Some workers favoured work which made no demand on the brain and involved no mental strain, allowing them to daydream while at work. On the other hand, in general, it was of course desirable to reduce monotony as far as possible. And in regard to the factor of physical fatigue, it had been demonstrated that a 56-hour week was just about the limit for truly economic production under peacetime conditions.

Associated Gas and Water Undertakings, Ltd., are paying a final dividend of 2½% actual, less tax, on the Ordinary Stock, making with the interim already paid, 5% actual, less tax (same), for the year ended March 31, 1944, and a final dividend on the deferred stock of 3% actual, less tax, making 6% actual, less tax, for the year (against 5½%).

The Institution of Chemical Engineers and the Institute of Physics announce a Joint Conference on "Instruments for the Automatic Controlling and Recording of Chemical and Other Processes." Provisional arrangements have been made for the Conference to take place in London on Sept. 22 and Sept. 23. The purpose of the Conference is to promote the interchange of knowledge and experience between those employing automatic controllers and recorders in different fields, and to encourage collaboration between physicists and chemical engineers. It will be open to all interested without charge, whether members of the organizing bodies or not. Further particulars will be sent in August to those sending a request for them to the Organizing Secretary, Joint Conference, c/o the Institution of Chemical Engineers, 56, Victoria Street, S.W. 1.

North of England Gas Managers' Association

Presidential Address*

by

JOHN W. PALLISTER, Assoc.M.Inst.C.E.,

Gas Engineer and Manager, Middlesbrough

WARTIME regulations restrict severely the scope of an Address of this kind so far as it relates to one's works and plant, and my remarks have, therefore, been confined to utilization, with some brief notes on the general position of the Middlesbrough Undertaking. The following details will illustrate the remarkably prosperous state of the undertaking, which has always placed service to its consumers as its chief aim. The town is an industrial one with a working-class population preponderating, and residential districts on the outskirts. The area of supply extends through a number of country towns and villages in the Cleveland District. The charges for gas to the ordinary domestic consumer are the lowest in the country—*i.e.*, 5.22d. per therm, or 2s. 2.1d. per 1,000 cu.ft. of 500 B.Th.U., no matter how small the quantity consumed, and this charge falls substantially on a simple block tariff applied to all consumers, domestic and industrial alike. All meter rents were abolished a few years ago. Works and distribution plant are maintained in the most modern state of efficiency. Mains have been laid of ample capacity, resulting in adequate pressures throughout the district, and all roads are provided with a separate main on each side, none of which is laid of a smaller size than 4 in. diameter. All service pipes are of steam quality, wrought iron, wrapped and coated, and nothing less than 1 in. diameter is laid. Service pipe renewals have been carried out on a generous scale. Wet meters have been gradually brought in and scrapped during the past few years, and none of these now remains. Lights meters have been removed and replaced with high-capacity meters of ample size. Meters are brought in, tested, and repaired on a census basis, and old meters scrapped and replaced. The sulphur content of the gas is already down to the first stage of the Post-War Planning Committee's recommendation of 10 grains. The total capital expended on the Undertaking amounts to a million pounds, of which 80%, or over ¾ million pounds, has been redeemed out of profits, leaving an outstanding debt of only £204,000, or £100,000, taking into account the Reserve Fund, equivalent to only £66 per million cu.ft. of gas sold. In addition, a sum of £173,000 has been contributed from the profits of the Gas Undertaking to relief of rates, a practice which was fortunately discontinued 18 years ago; some municipal authorities which have pursued this policy are to-day faced with high charges for gas and heavy capital expenditure and little or no reserves. During the past five years substantial sums have been placed to a Reserve Fund, which now stands at £100,000. Taking all these factors into account, it would be difficult to find a more prosperous undertaking in the country. In 1939 the Stokesley Gas Company was absorbed and the area of supply extended from 20 to 72 sq. miles. During these five years the sale of gas in the area of the former Stokesley Gas Company has been practically doubled and the price of gas reduced, and the revenue is sufficient to cover the whole of the interest and redemption charges on the purchase price of the Company and the extension of the mains, and leave a substantial margin. Service and pressures have been much improved. Sales of Calor gas have been extensively developed in the rural areas, where remote from gas mains.

These details illustrate:

(1) The advantages of public (in the form of municipal) ownership of a gas undertaking, due largely to the fact that a local authority can borrow money on cheaper terms than a company, and can redeem its outstanding debt from revenue. But the full advantages of municipal ownership only accrue where there is a wise financial policy—*e.g.*, the avoidance of milking profits for relief of rates; and the absence of undue restrictions on the initiative of the gas engineer and his development policy, which, it must be admitted, are sometimes associated with local government and the Civil Service.

(2) The advantages, where it is practicable to apply it, of a low basic price of gas available to all, and free from complicated tariffs which the consumer does not like and cannot understand; and from this basis building up the sales per consumer until capital charges per unit sold are greatly reduced.

Middlesbrough enjoys the advantages of a 100% supply of coke oven gas, but this has only a small reflection on the financial position or the low charges for gas. The modern gas-works carbonizing plant can produce gas at very little higher cost, inclusive of capital charges, than the enhanced value attached to coke oven gas in some of the contracts which have been made. Many gas undertakings are purchasing coke oven gas at lower prices than Middlebrough, with much higher charges for gas to consumers, and without having provided and maintained adequate stand-by plant at their works. We maintain in first-class condition ample plant to meet the whole of our output, which has had to be brought into operation on many occasions at extremely short notice, and sometimes for long periods. Gasholder storage is provided on a very ample scale equal to 48 hours' demand.

On the question of the price to be charged for coke oven gas, it must be borne in mind by suppliers that gas undertakings are required to carry obligations for the maintenance of supply, to ensure which they must maintain stand-by plant. Also duplication of plant must be provided at a gas-works to a much larger extent than is considered necessary at coke ovens.

The domestic consumer has been regarded as the backbone of the undertaking, and the policy one of maintaining the lowest possible price for that class of consumer, rather than selling large quantities of gas to industrial consumers at rates which return only the barest margin of profit. Consequently sales have consistently increased and large profits have been made and ploughed back in reduction of outstanding debt. The industrial load has by no means been neglected. On the contrary an energetic sales policy has been pursued in the direction of a large number of small industrial and commercial users at an adequately remunerative price, rather than in huge blocks to individual consumers at prices showing only a fractional margin of profit on cost of production. The nature of the industries in the area—mostly heavy industries engaged in the basic manufacture of iron and steel, with ample surplus gases from their own processes—lends itself to this policy.

It is to be expected, with the extremely low charges for gas in Middlesbrough, that the consumption per consumer would be high. The actual figures are as follows:

	Cu.ft.	Therms.
Annual consumption per domestic consumer, excluding all commercial and industrial consumers and public lighting: Ordinary meters ...	40,400	202
Ditto Prepayment meters ...	28,900	144.5
"All-in" average consumption per consumer, total sales (ordinary meters) divided by total number of consumers	54,900	274.5

While these figures are double the average for the country, I regard them as offering great scope for future development, and plans were made with this object in view, just prior to the war, which will be pursued vigorously on the return of normal conditions. The consumption per domestic consumer has steadily increased by 15% during the past 7 years. Close records have been kept during the past 7 years to ascertain the consumption and cost of an all-gas heating service in a number of consumers' houses where no coal or solid fuel whatever is used, with check meters on individual appliances. We have demonstrated to the satisfaction of these consumers that with our price of gas an all-gas heating service, fulfilling every heat requirement in the home, can be provided at a lower cost than coal, and with the consequent saving in labour and dirt. Electricity is used for lighting, radio, and vacuum, and for ironing. Gas is used exclusively for cooking, refrigerator, room heating by means of gas fires, water heating by means of a circulating boiler, and wash boiler. The average annual consumption and cost at the current prive of gas on the ordinary domestic rate is as follows:

	Cu.ft.	Therms.
Hot water	61,000	305
Refrigerator	11,000	55
Cooking and room warming	56,000	280
Total consumption	128,000	640
Total cost per annum...	£13 3s. 9d.	
Cost per week	5s. 1d.	

The average annual electricity consumption is 531 units at a cost of £3 9s. 2d.

Some of the amenities provided above are additional to what would be possible with coal—*e.g.*, bedroom heating night and morning, and refrigerator.

To give the above heating service by electricity would require a consumption of 12,000 units of electricity, which, at ½d. per unit and a £2 5s. standing charge (minimum), would cost £27 5s. per annum, or more than double the cost for gas.

War Conditions

The war brought many problems, and seldom a day began without new ones cropping up; air raids, damage, shortage of materials and supplies, the continued depletion of personnel, and not least the multiplication of work resulting from all the elaborate paraphernalia of Government administration. Under the Emergency Powers Act a ceaseless stream of Orders with their attendant and frequently contradictory amendments and forms, issued piecemeal at the rate of 2,000 a year, were often confused and involved, and in some respects beyond all understanding (even, one sometimes suspected, by those who drafted them). Hard and fast rules laid down by a central or regional authority are bound to result in many ridiculous anomalies when applied to industrial units; this was exemplified over and over again.

Much has been said regarding the future integration and reorganization of the Industry, and it is impossible to foresee the outcome at

* Delivered May 4.

this stage, so much depending as it does on the type of Government and its intentions after the war.

Of future prospects in regard to gas manufacture, the development of an economic method of complete gasification would be the solution of many of the Industry's problems, and remove the anomaly whereby it has to compete against its main product by the sale of coke, which fuel, while it is smokeless, has not the advantages of heat on tap. It is to be hoped that no expense will be spared by the Gas Research Board in the pursuit of this objective.

Recruitment and Training of Personnel

Much deliberation has been given under post-war planning to many important matters affecting the Industry, but consideration of the need for adequate training of personnel, more particularly, perhaps, on the distribution and supply side, has been neglected. It will be of immediate importance after the war and should loom large in post-war plans. Not only is the problem one which would, in any case, have required planning to meet the new conditions of the post-war world, but there will be a tremendous amount of leeway to make up in regard to youths who have been absent in the Forces.

The sale and installation of appliances are only a means to an end—increased gas sales. Service and maintenance are of paramount importance with the wide range of modern gas appliances, and their greater efficiency as compared with those of a few years ago. Much can be done by undertakings in the selection of the right type of youth, and in their training as installation and maintenance fitters, but there is need to go much further than that. Watson House gave useful facilities for training before the war, but only a very small percentage of gasfitters in the Industry received instruction there. A Central Training School should be set up for the Industry under the aegis of the National Body. The cost could best be borne by inclusion in the subscriptions of member undertakings. There is ample scope for a permanent institution of this kind to which every gasfitter in the country, and other personnel, could be sent for short periods of training in up-to-date methods by expert lecturers, complete with hostel accommodation for the visiting trainees. It would appear that a more central and easily accessible place for the whole country should be chosen than London. A Central Scheme such as this would be of far greater value than any regional schemes, which could not possess the facilities of a central arrangement. The value of the training would repay undertakings many times over for the cost involved; there is no shadow of doubt about that. When individual efficiency has been attained it follows that it should be adequately rewarded.

Every engineer owes a duty to the Industry, to his undertaking, and to his consumers to encourage the education of his staff in every possible way, and this should apply to workmen as well as to technical staff. In Middlesbrough, members of the technical staff have been required to attend the annual series of short technical courses at Leeds University, and fees, travelling and out-of-pocket expenses have been borne by the undertaking. Similar facilities are provided for as many members of the staff as can possibly be released to attend meetings of the Auxiliary Section, the Industrial Gas Centre, and the Gas Salesmen's Circle. More undertakings might provide these facilities to their own advantage. The expense involved pays handsome dividends by the exchange of ideas which takes place at these meetings, which assist and encourage the staff to keep up-to-date, as I have found by discussion with those concerned on their return from meetings. I had a high regard for the usefulness of the Gas Salesmen's Circles and discussion groups, where suggestions and guidance on discussions were circulated by Headquarters, and I hope to see these resumed after the war. Prior to the outbreak of war considerable headway had also been made in Middlesbrough in the training of gasfitters, parties of whom were sent on courses each of about one week's duration to appliance makers' works. These included water heaters, refrigerators, central heating boilers, &c. Wages and expenses were paid. It was found that the instruction given in the operation, maintenance, and repair of these appliances was most thorough. The men concerned thoroughly enjoyed these courses, which gave them an added interest in their job, and the results have proved of inestimable benefit to the Undertaking and to consumers. Frequent advantage is also taken of the facilities provided by domestic appliance manufacturers in providing expert technical representatives to lecture and demonstrate to the men, in works time, on the maintenance and adjustment of appliances. A complete library of text-books is maintained for the use of the gasfitters and technical staff, and the technical journals are circulated among them each week.

Competition

Post-war plans for development will be affected to a considerable degree by the extent of the competition likely to be experienced after the war, which leads me to discuss our position in relation to our chief competitor, electricity. If left to their own devices there is little room for doubt that the wider field open for development would lead to an intensified competition between the two industries even surpassing that of pre-war days. But it appears certain that, while some measure of competition is bound to continue, the Ministry of Fuel and Power will not permit wasteful and unscrupulous rivalry between different types of fuel. In Middlesbrough the two undertakings are controlled by a joint Gas and Electricity Committee, and while there is a healthy state of competition, nevertheless cordial relations exist between the two undertakings, with a great deal of co-operation, and wasteful forms of competition are avoided. Each has its own separate field of development. No modern house can be considered complete without a dual service of gas and electricity. Electricity is ideal for lighting and power, and gas for all heat requirements. Every new house built in the years prior to the war was equipped with electric lighting, and power for radio, vacuum cleaner, and electric iron, and almost invariably with gas cooker, gas washer, and gas fires. Water heaters and refrigerators, where fitted, were generally gas-operated.

Water Heating

The most promising field of development in the near future is water heating, and here the Gas Industry has available a range of appliances to meet all requirements. Much discussion has taken place on the merits of instantaneous versus storage heaters, and there is a great need for the Industry to make up its mind on the type of water heater to recommend for specific purposes. After several years' experimenting in my own home, as well as in those of consumers, with various types of appliances, I have come to the conclusion that the ideal form of heater for a constant and ample supply of hot water for all requirements in the average family house, with the minimum trouble and maintenance, is the gas-heated circulator. Sink heaters, single-point bath heaters, and multi-point heaters are invaluable in certain circumstances where facilities for hot-water supplies are already non-existent. For instance, in Middlesbrough there is a considerable number of the older houses without any hot-water installation. In these circumstances a circulator is not so suitable on account of the additional cost of storage cylinder and connexions; a sink heater, bath heater, or multi-point, however, is easily adapted, and has proved a boon to the occupiers of these houses.

We have found the greatest scope in the installation of gas-heated circulators in parallel with the existing coal range boiler, and utilizing the existing storage cylinder. Many consumers make use of the gas circulator principally in the summer months when the coal fire is not in use. and this is certainly a good seasonal load. On a number of circulator installations in Middlesbrough check meters have been fitted in order to obtain accurate information regarding consumption, and in some cases water meters also. It is found that an adequate hot-water supply is provided throughout the year in houses where no coal or solid fuel whatever is used at a cost of 2s. 5d. per week at the ordinary domestic rate. No attempt was made at economy on these installations, the burner being left on day and night throughout the year, operating on the thermostat. This provides an annual consumption of 300 therms of gas. The Report of the Utilization Sub-Committee of the Post-War Planning Committee of the British Gas Federation gives the gas consumption required for water heating for the normal family as 50 to 200 therms per annum, and suggests that these figures might be increased by 20% on the North-East coast, which would amend the figures from 60 to 240 therms per annum. I would certainly consider this allocation to be inadequate even as a minimum, at any rate in my district. But by comparison with these figures, the hot water supply provided by the 300 therms of gas would appear to be adequate, as, in fact, is proved in practice.

Let us compare the cost of electricity for the above service. The annual cost for the 300 therms of gas consumed amounts to £6 5s. Allowing an overall efficiency of only 50% for the gas-heated system, and 100% for an electric immersion heater, an input of 150 therms would be required for the latter. This is equivalent to 4,396 units of electricity, which, at ½d. per unit, and a £2 5s. standing charge (minimum), would cost £11 8s. 2d., or nearly double the cost for gas heating. The figures quoted above are for unlagged cylinders. Tests made over a lengthy period on installations before and after lagging show a saving in gas consumption of as much as 25%, with a properly made asbestos insulating jacket completely covering sides and top of cylinder, and lagging of exposed pipes, which reduces the weekly cost for gas to 1s. 10½d. The lack of domestic help during the war, which would appear likely to continue in the post-war era, has enhanced the boon of a constant and automatic hot-water supply enjoyed by those of our consumers fortunate enough to possess gas circulators. They are the envy of their neighbours, and will greatly assist our sales of these appliances after the war. The maintenance costs for gas circulators have been found to be almost negligible, and much less than those for instantaneous heaters, where by-passes in particular require frequent attention. This has been partly due to our restricting the range to a single make of robust construction and ample capacity. The size fitted is almost invariably one having a consumption of 30 cu.ft. per hour; no smaller size is supplied. A further great disadvantage of the instantaneous heater is its dependence on a certain degree of water pressure for its operation. A low water pressure through under-capacity mains and services is not uncommon, and is, in fact, very prevalent in Middlesbrough.

Domestic Lighting

The efforts continually being made to keep domestic gas lighting to the fore should be abandoned, and this should be done openly and not merely passively. Attempts made to retain it and keep it before the public eye actually do much harm to the Industry and are inimical

to our interests. It is time the Industry as a whole took a realistic view of this matter. Nothing has done more in this modern age to create the impression that gas is old-fashioned. The revenue obtained from domestic gas lighting must be many times out-weighed by the damage it does to our prestige. Electric lighting in gas showrooms and offices should be universal and obtrusive, as it is in the majority of gas managers' houses. Let the consumer see that we are modern and advocate, and use, nothing less than the best; but if they require the best means of cooking, space heating, water heating, &c., then added weight is given to our recommendations of the appliances in the showrooms. Many of our consumers are at first taken aback at our attitude in this respect, but they soon indicate that they are very favourably impressed and show renewed interest. We still have domestic lighting in houses in the older parts of the town, where electric cables have not been laid or where the expense of wiring is considered too great. We do our best to help these consumers by supplying free fittings and maintenance, but I am as mindful of the harm it does to our prestige, as these consumers would themselves welcome electric lighting if they could get it. It is to be noted in this connexion that the Report of the Utilization Sub-Committee of the Post-war Planning Committee of the British Gas Federation indicates electric lighting in each room among the facilities which might be provided.

Street Lighting

At first glance is may appear inconsistent to advocate gas for street lighting and decry it for domestic lighting, but the disadvantages attached to the latter do not apply to the former. Street lamps are thoroughly cleaned, adjusted, and remantled where necessary, once every ten days, and they are inspected every day to see that they are burning correctly. Reliable automatic control is easily applied, and constantly burning by-passes are not necessary; and objections due to discoloration of ceilings and noise and heat of burners do not apply.

As Public Lighting Engineer to my Corporation, with control of 3,400 gas lamps to 53 electric lamps, I am certainly of the opinion that gas can compete with electricity both economically and on technical grounds, with the existing equipment as compared with any equipment which is at present available to electricity. Improvements will surely take place in both. There is need for a gas lamp of higher lumen output to meet the requirements of the highest classification of lighting. The importance of the load to my own Undertaking is apparent from the fact that the annual consumption for this purpose amounted to 100 million cu.ft., or 6.6% of the total output.

Although a great deal of time has been devoted to the post-war reorganization of many industries and public services, no attention appears to have been given by the Government to public lighting, which may not be surprising in view of its almost complete eclipse during the past five years. In view of the probable extension of Government control in many directions, however, it appears likely that there may be the creation of a central lighting authority, and it may be desirable, in the interests of improving and making uniform the street lighting throughout the country, to effect control by legislation. This would almost certainly involve grants from the Exchequer to local authorities, or the removal of the cost entirely from local rating to national funds.

Considerable headway was being made in Middlesbrough prior to the war in improving the standard of lighting in both traffic routes and residential areas, and maintenance was well organized and lamps were kept in good order. I have already drawn up plans for improved lighting with complete new installations for eight miles of main roads for submission to my Council after the war.

Industrial and Commercial Load

Vast possibilities have been opened up during the past decade, and particularly during the war, in the use of gas for industrial purposes. A word of warning is necessary, however, lest cut prices for these loads do not prove a boomerang if the growth in output is so rapid as to entail additional capital expenditure, and one fears that many undertakings have continued to increase their industrial load by the sale of huge quantities out of all proportion to the domestic load at only a fractional margin of profit. Prospects of very large loads have come our way in Middlesbrough from time to time, but these have been eschewed when it has been found that they could only be secured at insufficiently remunerative prices. No single consumer exceeds a consumption of 12 million cu.ft. per annum, equal to 0.8% of our total output. The result of this policy is reflected in the healthy financial state of the undertaking.

Nevertheless, the industrial load has been very energetically developed during the past few years among a great many smaller industries at remunerative rates. Many central heating, hot water, and steam-raising boilers have been converted from solid fuel and oil to gas firing. Our early efforts with experimental "home-made" burners were not successful. But we have now had considerable experience of this work, and with the excellent types of conversion burners now on the market, supplied in complete outfits for various standard makes of boilers, excellent results are obtained with high efficiencies, providing that intelligence and the results of experience are used in the fitting of internal baffles to ensure the transference of the maximum amount of heat. We now have no less than 183 gas-fired boilers in our area, and the total boiler load amounts to 168 million cu.ft. per annum. A regular system of maintenance and cleaning is followed and complete records are kept. I have recently put forward proposals for a system of district heating by means of a centrally-situated gas-fired boiler plant.

We have also been very successful in the baking industry, and practically the whole of the bakers in the area, large scale and small, have been brought over to gas firing, either by the installation of new gas-fired ovens or the conversion of solid fuel ovens to gas, with a total consumption of 32 million cu.ft. per annum. These conversions have been most successful, and in every case given complete satisfaction. Following a recent incident at the works supplies of gas had to be curtailed, and to ease the position we re-converted a number of these ovens to solid fuel. As some of these consumers had been persuaded only a short time previously to convert from solid fuel to gas, it would not have been unexpected if this experience had caused them to regret their decision. On the contrary, they were clamouring to be converted back to gas at the earliest possible moment, as both the owners and their staffs were soon exasperated by the dirt and labour involved after their experience of the trouble-free advantages of gas.

Domestic Appliances

All who keep close observation on the reactions of our domestic gas consumers (and it is of the utmost importance that all administrators of gas undertakings should do this) will agree that the conditions created by the war have done more than anything else hitherto to demonstrate to them the advantages of gas appliances in regard to labour saving in the home. Owing to the complete lack of domestic help during the war, many housewives have learned for the first time the full value of gas in this respect; not only in households of the higher income group which formerly employed domestic help, but also in working-class homes, where often the whole family were out working, either whole or part time, or on shifts, and the attention necessary with solid fuel was impossible. The value of heat on tap was learned by many. I envisage a greatly increased demand as a result of this experience when appliances become available. We have generally been quite ready to concede the predilection of the consumer for a coal fire in the living room. Such was, indeed, the preference in my own home. But after two years, during which no coal whatever has been used, due to lack of domestic help, we much prefer the gas fire and will not revert to coal, and I have heard other consumers evince the same opinion. Moreover, the continued increases in the cost of coal, severe as they are in their reaction on our costs, are not without their mitigating effect in another direction—in aiding the process of displacing the use of solid fuel on the part of domestic and other consumers by gas. If this is to be encouraged, however, the coal processing industries should be given the benefit of lower coal prices, and, of course, suitable coal for their purpose.

There is, nevertheless, excellent scope for the use of gas in the solid fuel fireplace. A plug-in point, preferably with a bayonet tap, with the use of a gas poker, is a boon in saving time and labour, and with the lighting of nine fires from a pennyworth of gas is also cheaper than the use of sticks. We have devoted considerable publicity to the sale of gas pokers and have fixed some thousands of these. The sale of one or two in a street quickly results in a further demand. We invariably endeavour also to supply a portable gas fire, which is most useful for numerous short periods when the coal fire is not in use. We favour a really useful 7-radiant type of framed fire with flue, such as the "Newscreen" which will heat the average small room adequately, rather than the midget type of portable.

Judging by replies to questionnaires by women's organizations on the post-war home, the desire for a refrigerator seems to be pronounced. As the most serviceable refrigerator unit is gas operated there should be a wide new field here, but they have been much too costly, and need competition and mass production to bring the price within the reach of the many.

The use of electricity in the domestic field should not be feared—we should make it work for us, as we have done in the retort house and the works, where electric motors were at one time taboo. Mains electric ignition of all cooker burners and gas fires will inevitably replace the flint and steel abortions which necessitate so much scratching and scraping, and eventual recourse to the matchbox; and a gas heated wash boiler with electrically-operated wringer and agitator would be an ideal combination and a "best seller." Such applications as these would do more than anything to popularize the use of gas as a completely modern fuel. To some these ideas may appear revolutionary, but a revolution of progress in every sphere lies ahead in the post-war years, and we must be prepared to advance with the times. I look forward with the keenest anticipation to the prospects which lie before us, transcending anything we have seen before, and to the rapidly approaching time when we can resume "full speed ahead."

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

The Organization of Research*

By A. PARKER, D.Sc., M.I.Chem.E.,

Director of Fuel Research in the Department of Scientific and Industrial Research

(*Concluded from p. 571*)

In most large research establishments, especially those in any way connected with industry, the senior research staff must include specialists in several branches of science and technology. In fuel, for example, there are required chemists, physicists, engineers of various kinds, including chemical engineers, and for some problems geologists and microbiologists. At this grade of staff there becomes a horizontal organization with the senior specialists in charge of the various branches. Further subdivision of each branch must then depend on the investigations in hand and the characteristics of the various members of the staff. All this does not mean that there is segregation of the specialists in different branches of science and technology. In fact segregation is definitely bad. The leader of a team engaged on an investigation requiring chemists, engineers, and physicists, for example, may be chosen from any one of the three groups of specialists. There must be flexibility in arranging teams according to the nature and stage of the investigation, and the qualities, knowledge, and experience of the men available. Sharp division of the sciences into chemistry, physics, geology, &c., may be convenient in planning courses of training for students, but sharp division of this kind must not interfere with the selection of a team for an investigation requiring the application of several sciences; nor must the leader give undue weight to his own particular science.

Most first-class research men can profitably supervise several assistants of various grades, from graduates of average ability down to juniors of intermediate B.Sc. standard and laboratory assistants, in addition to the necessary industrial workers. If adequate assistants are not provided, then the best value is not being obtained from the first-class men. There are, however, some first-class men, particularly some of those suited for work of a fundamental character, who are primarily good individual workers and do their best with, say, only two or three assistants. These men have their value, and every large research establishment can find a place for a few of them with advantage. They are often the men who bring forward those original ideas that in due course lead to almost revolutionary advances.

In research which includes development work with pilot plant and full-scale plant, there must also be skilled, semi-skilled, and unskilled industrial workers. It is usually desirable to place the industrial workers in charge of the works engineer, who is responsible for supervision of the plant construction, maintenance, and general operation, and for ensuring safety precautions. As required, industrial workers are allocated to research teams.

I now wish to refer to what might be termed specialized auxiliary services. There is often a large amount of chemical analytical work which can best be undertaken for the research teams by a central analytical laboratory, staffed by skilled analysts. This is the arrangement at the Fuel Research Station. Not every research chemist who requires accurate chemical analysis is an expert in this type of work. Even if he is an expert, he may only require one or two samples analyzing, and if he did these himself it would prevent his doing other work until the analyses had been completed; whereas the analytical laboratory can undertake at the same time the analysis of a large number of samples required by several different teams. In this way the analytical work is better organized in relation to manpower and the equipment is more fully employed.

In addition, we have research analysts, who have to investigate or devise new methods for special purposes, or are given the task of improving existing methods in common use. Much of the work of the research analysts later finds application in the ordinary analytical laboratory, and in accurately defining routine methods to ensure truly comparative results.

Another special service is given by certain of our physicists, who are specialists in X-ray diffraction, spectrographic and similar work. They not only serve other research workers, but undertake research in their own line.

We also have our own expert glass-blower, though much of the simpler glass-blowing can be, and is done by the research chemists and their assistants.

In addition to the ordinary engineering workshop, we also have a well-equipped instrument workshop with highly skilled men who not only repair and calibrate instruments purchased from specialist firms, but also design and make much of our laboratory apparatus and equipment. There are also woodwork and electrical workshops, to serve the station and laboratories generally, and a central drawing office. Mention should also be made of our trained photographer, with the equipment he requires for preparing photographic records, lantern-slides, micro-photographs, &c.

Clearly there must be chemical, engineering, and other stores, in charge of storekeepers maintaining accurate records of stocks, and materials and apparatus in use. Good storekeepers ensure that stocks of chemicals, fittings, and other materials in regular use are adequately maintained, so that there is no waste of time waiting for materials, and they keep an eye on equipment in the hands of those research workers with a flair for occupying much valuable laboratory space by retaining the equipment after it has served the purpose of their particular work.

A good library and intelligence service is essential, and there should be provision for the prompt circulation of brief informative abstracts of British and foreign scientific, technical, and other literature of interest. Abstracts of this kind cannot properly be prepared by experts in languages who have insufficient knowledge of science; they can only be prepared by scientists with a knowledge of languages and an aptitude for work of this kind. Adequate administrative and clerical staff to deal with general matters, accounts, &c., is essential, otherwise the time of the research staff may often be wasted in dealing with purely administrative and clerical affairs. One point that is often forgotten is that it is bad policy to skimp the shorthand and typing staff, as it causes delay in completion of reports and encourages research staff to spend time unnecessarily in writing in longhand documents and letters of a simple kind, which should not prove difficult to dictate after some experience.

So far I have said nothing about provision for the welfare of the staff. There should be a good canteen and dining-rooms. Experience shows that industrial workers generally prefer to have their own dining-room rather than share a room with the research, administrative, and other non-industrial staff.

If the staff dining-room is properly planned it can be used for staff meetings, as a lecture-room, and even for occasional socials.

General welfare and comfort is just as important in a research establishment as in a modern factory, though this point is not always appreciated. With a staff of, say, 300 or more, a well-equipped First Aid room with a trained nurse is a good investment, and cleanliness and immediate attention to even minor injuries should be insisted upon.

From what I have said it should be clear that I believe in the team spirit in the broadest sense, without killing individuality, initiative, and enterprise. Co-operation with other research organizations and exchange of information should be encouraged. No one research establishment can efficiently undertake all types of investigation. The Fuel Research Organization, even now in wartime, have investigations in progress in three University Departments, and for some years it has been the practice to send one or two members of the qualified staff to work for a year or two in a University. We also co-operate with other research organizations and with industrial undertakings in investigating problems in which co-operation is advantageous. The future policy will be to extend this kind of co-operation. Isolation leads eventually to stagnation.

In the time at my disposal I cannot discuss the details of planning buildings and equipment, but one point I should like to stress. Requirements for research change. It is wise, therefore, to allow for provision for extensions of buildings without upsetting the general plan. In the laboratories it is a mistake to have too many fixed benches with little free floor space. There should be sufficient free space to allow for movable tables or benches, so that there can be flexibility in arranging for changing types of work. The same principle should be adopted in planning the chemical engineering or other laboratories for semi-scale work; in laboratories of this kind, flexibility can be achieved by judicious use of such equipment as adjustable tubular or similar scaffolding, with movable platforms.

DISCUSSION

Dr. E. W. Smith (President of the Institute) said there was no necessity for him to introduce Sir Harold Hartley as Chairman of the meeting. Continuing, he said he had very strong views personally that a research director ought to confine himself primarily to research, and that the political side of research—he was not thinking of the Fuel Research Board, but was thinking about the Gas Research Board, the British Coal Utilization Research Association, and many others—should be carried on primarily by the Chairman, or those connected with the control of research. He believed there ought to be a lot more collaboration between research associations, collaboration of the sort which Sir Harold Hartley was bringing about with great effect in connexion with fuel. He felt it was essential that these different organizations should tell them some of the details of the organization of research ; where ideas came from, the sources from which they expected to get suggestions, the type of information on which research was based, the question of authority over the research workers, how that came back, how it was worked out, and how it was presented to the outside world.

The **Chairman** said the President had explained what had been the idea of the Council in arranging this series of Papers dealing with the organization of research, and he was sure they would all agree that it was an extremely good idea, and one

* From an Address to the Institute of Fuel, April 20.

that was going to be very helpful to many of them who had to face a good many new problems in connexion with research laboratories and research organizations at, they hoped, a very early date. It was easy to make optimistic speeches about what research might do, and to explain what an expenditure of £1,000 had produced, and what an expenditure of £1,000,000 might produce, but he thought as technicians they had a very serious responsibility. As Dr. Parker and the President had pointed out, they had been partly responsible for awakening the public conscience, and now, as Dr. Parker had said, it was their job to see that there was no loss of confidence and no disappointment. When, as he thought they would, they got a wider opportunity, they would have to do a great deal of hard thinking and a great deal of planning to see that they made the best possible use of those opportunities. Meetings of that kind, with a Paper like Dr. Parker's and with the Papers that were coming later, which would deal with the more individual problems of specific organizations, ought to be extraordinarily helpful to all of them who had to work out the details of those schemes, and who would have the responsibility of securing the right co-operation between individuals and between teams in each association and in each laboratory, and of securing co-operation between the different research organizations, in universities, in Government establishments, and in industry upon which our success was going to depend.

Dr. **J. G. King** (Director, Gas Research Board) said that a time of accounting might very well come for those who were pushing research at the present time, unless they all set their house in order in some such fashion as Dr. Parker had described and carried out these schemes of research which, while they were not entirely original, would have to be on a much larger scale than they had been in the past. Dr. Parker had given them a very clear outline of the organization of research, and there was hardly a detail of that outline with which he did not find himself in agreement. There were one or two things, however, which could be said in addition. He had thought very much on this subject recently because he was just at the beginning of expanding a nucleus research department to a much larger scale. His first point was that although in University research work there was a continual flow of new minds coming forward to help the professors in carrying out schemes of research work, and those new minds brought new ideas and an air of freshness into the general research schemes of the Universities, it was difficult to maintain that flow in an organized research department because there was a danger of the department becoming static. It took on young men when they left the University and it might or might not make their conditions of life so comfortable that they never wanted to leave, and they might stay for too long a time. This was a point where some associations differed from others, and an industrial research association had the advantage of having an industry behind it, and that industry owed a debt to its research department just in the same way as it expected service from the research department, and that duty could not be performed unless the research department brought in young men. The director might be clever and always choose people who were good at research, but the industry ought to take off his hands at intervals some of his research men who perhaps felt that they had done adequate service to research, or perhaps were tired of it and would like a larger view of things. Industry ought to provide its young men with good jobs where they could carry the gospel of research into industry and make good use of it. The industrial research association had the advantage that University men after a year or two of training could go into industry or the research association. The Government controlled departments were not perhaps in so favourable a position, but he thought Government departments would have to keep so close to industry that they could have some service from industry. There was no reason why industry should not take its men not only from its own industry, but also from Government departments. Dr. Parker had given a general view of how to organize a research department and of the present problems for all directors of research. He had made one tiny remark that the research director must be capable of originating, planning, and carrying through to its conclusion a research programme. He would like to put out of their minds the idea that a director must necessarily originate a programme; he could not do it. He contended that young men coming in fresh, with fresh ideas, brought out similar ideas in the minds of people who were perhaps the heads of departments, and less likely to change. The director must not be expected to originate all his own research activities. He must be capable of originating some and planning others that are put forward, and of carrying them forward to a correct conclusion. He would not say anything about the other attributes which Dr. Parker wanted to see, but there was another point, and that was administration.

Administration in the research department cost money, just as much as research did, and it seemed to him that no research department could do its best for the money that was available unless it organized itself to take care of the routine work, and let the research man do the job he was there specially to do. It should be quite obvious to everybody that organization cost only a proportion of the total money allocated to a research department, but it did not follow that more money would be spent if the grant were doubled. A doubling of the grant must mean a disproportionate increase in the money spent on research proper.

He would like to make one more point, the remedy for which had so far eluded him. In an industrial research establishment which perhaps served small units all over the country there was a necessity for a central group, but the necessity did not stop there. There was also a necessity for small groups in Universities and Government departments, and in the works of the constituents of the research association. There might be a necessity for using large quantities of raw material. The stuff had to be sent from the central establishment to the works for use, but the great difficulty he saw was concerned with the staff. How was one going to keep comfortable and happy those members of the staff from headquarters who were moved all over the country to places where facilities were not readily available, such as Leeds, and Edinburgh, and Bournemouth? Were they going to use only their junior staffs, and those who had not settled down in homes of their own?

Dr. **H. Hollings** said Dr. Parker has asked them to fill in some of the details of his very interesting outline, and he would try to fill in just one or two of the details in the organization of a research department which appeared to him to be particularly important after some experience in an industrial research laboratory. First and foremost he would put the question of the recruitment of staff, to which reference had been made. It was in his view the most important single question. Research was such a personal and human business that unless they got the staff right, then nothing else could be right. One point which needed to be considered and planned for was to get the right and proper distribution of age-groups into the organization. He had seen several difficulties arise because here and there there had been too great a concentration of men of one age-group, and it was quite obvious what kind of difficulty that would lead to in the future. He was not thinking of the long distance view, but it might lead to difficulty after some five or ten years.

Then he would urge the desirability of recruiting from several different fields. He thought it was very important to keep a proper balance of men trained in University research with recruits who had received their early training probably within the Industry, having continued their education at the evening institutes and so on. He also thought it was important, if the organization was large enough, to secure that there was a proper balance between recruits from the older and the newer Universities, and proper balance, of course, between the several sciences. Such a plan of recruits working together in a staff would result in quite an interchange of benefits, and he could assure the meeting from his experience that at whatever level they took it, the flow of benefit was by no means always in the same direction.

There had been several references to the question of who was to initiate the research programme and initiate the flow of ideas. He would suggest that in the early stages the responsibility must lie with the Board of Directors, or with the research manager if the board of directors had not got a scientist on it. It was primarily the responsibility of the research manager to see that the right instructions were given to the research department. It was necessary to fix the initial responsibility at the top in that way. He would urge that the greatest possible freedom should be given to the flow of suggestions and initiative from the bottom upwards. If they had a happy team working together he thought it would be easy to foster such mutual confidence as would ensure that.

Next he wanted to say a word about the desirability of getting quite clear on each side in any investigation what was the motive and what was the objective behind the job. He would try to make himself clear by explaining how he would classify motive and objective. The most obvious for any piece of research was the establishment of some new process or the manufacture of some new product. Whether it was a new process or a new product, he thought it was of the utmost importance that those who were engaged upon the work should be quite clear whether there was a reasonable prospect for the economics of the process so soon as it could be established being favourable, or whether the investigation was still at the stage at which the technical possibilities were being investigated without any reference to economics at that stage. Other different objectives might be the establishment of some new technique or the education of the technical staff, either within the research laboratory or in the industry which the laboratory served. Finally, one possibility was that a piece of research might be undertaken in order to enhance the prestige of the organization or of the industry, or of the country. Sometimes he believed that that was quite permissible as a motive behind any piece of research, but he thought it needed careful control or it might become very dangerous. What he would plead for was that before research was started the director of the laboratory or the senior research workers should make themselves quite clear as to which category an undertaking fell into. The motive, the objective, must change as the work proceeded, and if it did change, then those who were engaged in it should have their minds quite clear on the matter. In a University he thought it might even be permissible to undertake research with the sole object of adding to the store of human knowledge, but if any investigation was continued in industry in the same spirit of inquisitiveness, then the cost might become enormous.

Mr. **J. G. Bennett** (Director, British Coal Utilization Research Association) remarked that there was a strange paradox which concerned research at the present time—the paradox of size. There were clear reasons which could be set out in detail for a research organization to-day, and Dr. Parker had shown the indispensable requirements as the background of research as they conceived it on a large scale at the present time. On the other hand, there was no doubt at all

that size was a disadvantage, and that size militated against certain qualities which were indispensable in research. He remembered reading, and he would never forget it, a story about a very original and brilliant scientific worker who, when asked what was the secret of his success, said he never read other men's Papers and never talked about his work, and there was a lot to be said for that attitude. If they talked too much about their work, and if they discussed it with other people, it tended to thin out. On the other hand, as Dr. Parker had said, one might have a research department with 50 or 100 workers and find the ludicrous position that a problem that was harassing one little group had already been solved by another group not 100 yards away. Every one of them had seen something of that sort occurring. There was a case for arranging for closer contact and frequent conferences of the workers, rather than for the writing of more reports and Papers, so that the people knew what they were doing. He always felt there was a real danger of throwing away the baby with the bath-water when they did that.

The more efficient they made research the more danger they were in of killing the spirit of it. When one considered the disturbing reference in Parliament to our meagre research expenditure and the enormous expenditure in the United States, and the small size of our research organizations and the great show made by other countries, one marvelled at what we had accomplished. According to Sir Ernest Simon we had produced more original work than any other country in the world, in spite of our wretched under-staffed research establishments and our inadequate facilities and so on. Where were we going in this cult of size in research?

Dr. Parker had made one remarkable omission. He had spoken of five ways in which research could proceed, but he had not referred to the individual research worker, working on his own, who was not supported by any University or industry or Government department. Yet how often had work of outstanding value been done by such a worker, sometimes by men with no support of any kind. A high proportion of the most original scientific work of the last 300 years had come from people under those conditions. If we got those great establishments and organizations that were so much talked about, were they going to crowd out all such really creative inspiration? Was there a risk of killing science by kindness?

Dr. **E. W. Smith** (President) said that in considering the question of the use of professors and Universities by research associations, serious consideration would have to be given to the principle of professors being retained by commercial undertakings. He felt that no Government department ought to support a University and its professor or research staffs if the professor at the head of the department had a continuing retainer from an industrial organization. His next point was that it was more important for a man conducting research that he should know his industry and have some flair for administration and for handling men, and that he should initiate original ideas rather than initiate lines of work. Practically any man, young or older, could offer original ideas, and the director of research should be a catalyst—one that caused things to happen. His last point was the question of training for research. He was at a meeting the other day at a University department where some industrialsts were discussing with professors the future of technical and scientific training, and looking round one was impressed by the big proportion of professors who were in various important positions, and it struck him that the policy adopted in the Universities for electing their lecturers and professors was altogether too haphazard. He estimated that nine out of ten professors in particular subjects were selected by people who were not very conversant with those particular subjects. They looked round for lecturers—and the lecturers became the professors—who did not like to go in for teaching outside and who wished to go in for industry. They were men of a reasonable standard always, but that was the method of selection. He did not think it would come up to the standard that a first-class industrial concern would think was necessary in the selection, say, of an accountant.

Mr. **J. Roberts** said he could not agree with the policy of the research worker who never read other people's Papers. He had always found interchange of information with co-workers very desirable and very profitable. He once set out to solve a particular problem, and the solution of that problem was very much assisted by the investigations of other research workers who never had that particular problem in mind, and the keystone of the argument was found in a Paper by Dr. Hollings and Professor Cobb several years earlier. He was referring to the solution of the problem of the origin of anthracite. They were working on the carbonization of coal, and their remarks were conclusive evidence in favour of the theory he had developed. Incidentally, recent work carried out by the B.C.U.R.A. seemed to indicate similar results.

Dr. **Parker,** replying to the discussion, said Dr. King had stressed the point about the day of reckoning, with which he entirely agreed, and he had pointed out that in the Universities there was a continual flow of new minds, whereas in a research establishment it might be difficult to provide the same inflow of new minds, because they might employ a staff all growing up at the same time and nobody coming in. Dr. Hollings's point about age-groups was particularly interesting. If research was developed steadily he did not think there would be any difficulty, because with steady growth they would have younger people coming along, and there would be no question of having a whole group of people from 20 to 40 now, and in twenty years' time the same group with ages from 40 to 60. He saw no great difficulties in young men going out from research departments into industry. In his own last line of work he lost good men because they got better appointments, but he felt that in going out into industry they were really nuclei for fresh contacts with industry. In his definition of the qualifications of a director of research he did not intend to imply that the director was going to produce all the new ideas. If he directed an organization with 300 employees he might produce 5% of the ideas. He should be able to get more ideas than he could wish from his own staff, and his job was to sort them out and use his experience in working them out. Dr. King had referred to the difficulties in recruiting the staff, especially if they were married. There was no doubt about it that it was difficult if an industrial research organization was doing work in different parts of the country to send a man for six months to one place, three years to another, and two years elsewhere. However, while he was in the Gas Industry there were no complaints, and certainly for half his time in that Industry he was married and he lived in three different towns. He certainly agreed with Dr. Hollings that they did not want all highly trained specialists all in one particular line. With regard to obtaining recruits from the different Universities, he felt that was provided for by the system of selection. They usually had a selection board which interviewed candidates, and all the best ones did not always come from the same University, and they got an automatic balance. He agreed that they must have clearly in their minds the reasons for undertaking particular investigations, otherwise they would find research men, or some of them at any rate, would get interested in some sideline and run after it, forgetting the main problem. Sometimes, of course, side tracks led to problems that were even more important than the original, but usually they did not. Mr. Bennett had referred to the size of organizations, and he agreed that they could get too big. That depended upon the organization and how it was appointed, and he thought in his remarks he had referred to different types of individuals, those capable of leading large teams, and those who gave of their best when they had not more than two or three assistants. Dr. Smith had referred to the question of professors and retaining fees. Work done for outside organizations by a University was in his view necessary, but it should not be carried so far that University departments and their staffs lost their freedom. He had already stressed that freedom and frankness should be the spirit of University departments. Dr. Smith had raised the question of the selection of the University staffs. Up to a few years before the war the Universities in this country had the pick of the students, and they managed to get really brilliant men in spite of the possible financial attractions of industry. Whether that would continue in the more difficult days of higher cost of living and higher taxation he did not know, because even University lecturers had to live.

Diary

May 11.—B.C.G.A. Domestic Heat Services Committee: Gas Industry House, 2.30 p.m.

May 12.—London and Southern District Junior Gas Association: Annual General Meeting, Gas Industry House, 6.30 p.m. Address by Col. C. M. Croft.

May 12.—Gas Companies' Protection Association: Meeting of Committee, 5, Victoria Street, S.W. 1, 2.30 p.m.

May 15.—London and Counties Coke Association: Finance Committee, 10.45 a.m.; Executive Committee, 11.30 a.m.; Central Committee, 1.30 p.m.

May 17.—Midlands District Gas Salesmen's Circle: "Coming-of-Age" Meeting, Imperial Hotel, Birmingham, 2.30 p.m. Address by Mr. R. J. Rogers.

May 18.—Industrial Gas Centres Committee: Gas Industry House, 10 a.m.

May 18.—Wales and Monmouthshire Association of Gas Engineers and Managers: Meeting at Pontypridd.

May 24.—B.C.G.A.: Annual Meeting of Members in Scotland, North British Hotel, Edinburgh, 2 p.m.

May 25.—Lancashire and District Coke Association: Annual General Meeting, Engineers' Club Rooms, Manchester, 11.30 a.m.

May 28.—Scottish Junior Gas Association (Eastern District): Annual Meeting, Heriot-Watt College, Edinburgh.

May 31.—Eastern Counties Gas Engineers' and Managers' Association: Spring Meeting, Connaught Rooms, Kingsway, W.C. 2.

June 2.—Gas Research Board: Joint Committee on Methane Synthesis, Gas Industry House, 2 p.m.

June 5.—Association of Gas Corporations: General Purposes Committee, 2.30 p.m.; Council, 3.30 p.m., Gas Industry House.

June 6.—Gas Research Board: Finance Committee, 11.15 a.m.; Membership Committee, 12 noon; Council, 2.30 p.m., Gas Industry House.

June 15.—Gas Research Board: Refractory Materials Joint Committee, Stoke-on-Treat, 2.30 p.m.

June 16.—Gas Research Board: Joint Research Committee, at Leeds or Bournemouth.

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Service Organization

The following is a report of the Discussion on the Paper by Mr. R. J. Pepper to the London and Southern District Junior Gas Association, March 29—see "JOURNAL" of April 12 and April 19.

Mr. **F. J. G. Blondin** (Gas Light and Coke Company) said he thought it would be agreed that whatever the sales policy might be, or any other policy of the undertaking for that matter, unless it was backed by a service which could meet the criticism of the most critical, they would not make that progress which otherwise could confidently be expected after the war. Systems should be subservient to the customer, and organization such that the undertaking presents one face to the customer and not a number of unconnected departments. There might be a tendency after the war to discount the regular inspection of gas and appliances, but he held the view that the best interests of the Industry would not be served if this gained ground. Between the Industry and the appliance manufacturers it should be possible to provide the public with reasonably trouble-free appliances, but they would find themselves completely out of touch with their customers if they decided to let appliances look after themselves.

Mr. **F. H. Cope** (South Metropolitan Gas Company) suggested that standardization be confined to appliance parts in the background, such as burners, oven parts, &c., but that individual maker's designs should be retained.

Mr. **Pepper** stated that standardization on those lines had been suggested in the Paper, but he hoped that eventually the variety of designs of similar appliances would be drastically reduced, as it sometimes led to confusion in the mind of the consumer and made service more difficult. He did not consider that refrigerators or electric cookers with a comparatively small range of designs had had adverse sales for this reason.

Mr. **Anderton** (Great Yarmouth Gas Company) asked what was meant by inconspicuous fixing, and asked for further details of the emergency organization with remuneration received by standby fitters. He wondered whether qualified plumbers were employed for lead work, and whether contractors were employed to carry out all carcassing.

Mr. **Pepper** stated that inconspicuous fixing meant that appliances should be installed as neatly as possible and show a minimum of pipework, the ideal being those with concealed supplies. A detailed explanation of the emergency organization was given, and he stated that remuneration consisted of payment for inconvenience suffered through standing-by, and that normal rates were paid for travelling and working time in remedying complaints. Plumbers were not employed for lead work, as fitters who have passed the "A" and "B" examination of the London Region Classification Scheme connected gas appliances to lead pipes and carried out other appropriate plumbing work. Contractors did not undertake all carcass work. The local office, together with approved contractors, all quoted to the representative's specification and the lowest tender received obtained the order. The work was then subjected to close supervision.

Mr. **H. W. Holgate** (Gas Light and Coke Company) remarked that the tendency already existed within the Industry for executives to employ salesmen capable of selling anything from matches to white elephants. A system as described might still further make such a policy look favourable. If this happened, the only man of the service organization in contact with the customer with a "service" outlook was the fitter. His other point is a criticism of the system. He contended that the Officer-in-Charge of the Service Clerical Section should be a technician—no clerk could be expected to visualize the details of a given job, and allocate it with confidence to whom he deemed the appropriate fitter, and what was more, being senior to his foremen, his acceptance of their advice in any particular allocation might not occur. Service covered a much wider field than that taken by the Paper, and he was convinced that the Industry would have to achieve a re-orientation of its outlook if it was to uphold its position. An appliance was merely incidental to the service. The customer was not interested in gas; he was interested in the results that its use could give.

Mr. **Pepper** agreed that salesmen should be more service minded. He disagreed that a technician was required to control the service section, as all jobs were checked by the foremen before being issued to the fitters, but he thought that some care must be exercised to select the right type of clerk for the job. He agreed that service should be better represented on the managerial staff of most undertakings, and he also advocated the idea of a fuel service.

Mr. **L. W. Andrew** (Gas Light and Coke Company) emphasized that close liaison was most necessary between the district and the research staff. He thought that this was not sufficiently stressed in the Paper. Service supervisors appeared to have so many duties that he wondered if they had time to be intimately in touch with district conditions.

Mr. **Pepper** replied that he always found the advice and service of the Research Staff at Watson House invaluable, but the reason for not giving this side of the work more publicity in the Paper was because so many undertakings unfortunately had not these facilities, and it was to those other undertakings that the Paper was mainly directed. When one analysed the duties of service supervisor the list of functions became much less formidable, and in actual fact a service supervisor spent about three to four hours each day on the district.

Mr. **T. S. Ricketts** (Tottenham and District Gas Company) felt that too little attention had been given throughout to the benefits to be derived on the district by increased efficiency at the works. In this respect Mr. Pepper stated in his conclusion that the "prosperity of the Industry will depend . . . on our ability to provide a fuel service that gives complete satisfaction to all consumers." This was wrong. It would depend on their ability to provide the cheapest therm in the most available form. Mr. Pepper had stated that such items as sulphur-free, gum-free gas, &c., were "well on the way to being achieved." This represented a compliment to his own Company, but it could not be applied to the Industry as a whole. The fact that the process of benzole recovery reduced the sulphur content reflected no credit upon the Industry, but was merely fortunate chance. The 33rd, 34th, 36th and 38th Reports of the Joint Investigation Committee dealt with the benefits accruing from the reduction of sulphur below 8 or 10 grains. But how many undertakings had done so? And how many undertakings had altered the position of their chloride washer in order to improve gum deposition? Prevention was better than cure, and these improvements at the works would greatly reduce the need for maintenance on the district. They must therefore separate the idea of regular maintenance (for maintenance to a degree would always be necessary) from the idea that it was the future salvation of the Industry, and if the position ever became such that the cost per therm to consumer had to be increased to cover increased cost of servicing, then it was time to look into the manufacturing process for improved efficiency.

Mr. **Pepper** thought that service costs should definitely be included in the price of gas. Progressive business firms usually recovered service costs from sales returns, and this was undoubtedly a good business policy which he thought the Gas Industry would do well to follow. He thought that the assumption regarding the gas quality, &c., was correct.

Mr. **C. A. Deas** (Tottenham) thought that the price of gas should be kept as low as possible and advocated the general introduction of suitable tariffs. He wished to know the effect of a sulphur-free gas on the maintenance of appliances.

Mr. **Pepper** agreed that tariffs would be most advantageous. The effect of a sulphur-free gas could only be accurately gauged by distributing it on to a closed area for a number of years, and carefully noting the advantageous effect upon the appliances fitted within that area. There was no doubt that it would be beneficial, but he thought that the greatest effect would be the increased sale of flueless heaters.

Mr. **L. J. Clarke** (Gas Light and Coke Company) hoped that the organization described would obviate several men calling to carry out one job, which caused inconvenience and exasperation to the consumer. He then asked the time which elapsed before an escape received attention.

Mr. **Pepper** explained that the ultimate aim was one man for one job, except where an assistant fitter was necessary, and supervisory calls by the foremen. Escapes should receive attention as soon as possible.

Mr. **R. F. Twist** (South Metropolitan Gas Company) stated that service started on the works and that it would cost 0.2d. per therm to render gas almost free from sulphur, and he asked if this sum would be recovered by the district from the saving of the maintenance of appliances or other means. He required to know how many different men the consumer would have to see to have a cooker exchanged.

Mr. **Pepper** stated he was not interested in the recovery of the 0.2d. per therm—the products of combustion must be free from obnoxious sulphur gases, and flues and appliances free from acid condense fluid, even if the cost of removal was far in excess of 0.2d. per therm. Details of the procedure necessary to exchange a cooker were explained.

Mr. **G. G. Warne** (Portsmouth), in a written contribution, asked for more information on the following points: (1) What control is exercised over the issue and replacement of tools? How is the improper use of tools, resulting in damage and loss, dealt with by the service supervisor? (2) During the years of training of fittings personnel, is some time provided for the apprentice to work in the distribution department? The two departments are so inter-related that a knowledge of both would be of benefit to both fittings and distribution men? (3) What reasons are there against the exployment at depots of 24-hour emergency men? Call-outs are not always satisfactory and cause delay; what average times elapse, for both fittings and distribution men, between the receipt of an emergency call and the arrival of men on the job?

Mr. **Pepper** replied that improper use of tools and the replacement of tools were controlled by the senior foreman, only bad cases being reported to the service supervisor. Lost tools and those damaged through improper use were paid for by the fitter concerned. Fitter apprentices were not employed in the distribution department. The principal reason against the employment of 24-hour emergency men was the very few complaints received outside normal working hours. The time which elapsed between the receipt of an emergency call and the arrival of a fitter seldom exceeded an hour, and the fitter always attended first and was responsible for the calling out of the distribution men unless it was initially definitely known to be distribution work.

Mr. **A. Abbott** (Gas Light and Coke Company) proposed a vote of thanks, and Mr. **F. H. Cope** (South Metropolitan Gas Company) seconded.

GAS PRODUCTS PRICES—STOCKS AND SHARES

The London Market May 8.

A new Government Order came into effect on March 1 controlling the price of Benzole and Coal Spirit and replacing the Control of Coal Tar Naphtha and Xylole Order, 1943.

The Order is known as the Control of Benzole and Coal Spirit Order, 1944 (S.R. & O. 1944, No. 172).

By this Order the price of Motor Benzole is fixed at 2s. per gallon. The Order also lays down the method of evaluating Crude Benzole.

The Order also calls for periodical returns to the Ministry of Fuel and Power from all producers of Crude and Refined Benzole.

The only item of interest in connexion with the Coal Tar products market is the issue of Government Order designated the Control of Toluene (No. 4) Order, 1944 (S. R. & O. 1944, No. 170), which contains an amendment of the Control of Toluene (No. 3) Order, 1943.

Prices of Coal Tar products are unchanged.

The Provinces May 8.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 11d. to 2s. 1d., pure, 2s. 7½d. (controlled by the Control of Toluene No. 3 Order, dated July 14, 1943, operative from July 20, 1943). Benzole and Coal Spirit, also Coal Tar Naphtha and Xylole, are now controlled by the Control of Benzole and Coal Spirit Order, 1944, dated Feb. 18, 1944, S. R. & O. 1944, No. 172, operative from March 1. Carbolic acid, 60's, naphthalene, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil controlled by the Coal Tar Products Prices Order, 1943, dated Oct. 20, 1943 (S. R. & O. 1943, No. 1528), operative from Nov. 15, 1943.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Scotland May 6.

Production and demand are well balanced with prices unchanged. Refined tar*: Yield to distillers is 4½d. per gallon *ex* Works, naked. Creosote oil: Timber preserving quality,* 5½d. to 6½d.; hydrogenation oil,* 5⅞d.; low gravity or virgin oil,† 7¼d. to 7½d.; benzole absorbing oil,* 6½d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha†: 6½d. to 7d. per gallon. Solvent naphtha*: Basic prices delivered in bulk, 90/160 grade, 2s. 8d., and 90/190 Heavy naphtha, Unrectified, 1s. 10½d.; Rectified, 2s. 2d. per gallon. Pyridine†: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

The number of markings on the Stock Exchange last week far exceeded those of the previous week. The upward tendency among industrials continued, and it was not until the close, when some profit-taking was in evidence, that any irregularity set in.

There was also a greater turnover in the Gas Market, principally among the stocks of the larger undertakings, and all price changes were in an upward direction. Gas Light units closed 1s. 3d. better, and on the local Exchange Newcastle units also hardened. A feature was the further rise of 5s. in Cape Town preference, while in the Supplementary List it will be seen that Newport 5½% debenture closed 5 points higher at 115–120.

The following quotations were changed during the week:

PROVINCIAL EXCHANGES

Bristol 5 p.c. max.	117½—119½	+1
Ditto 5 p.c. Deb.	120—122	+1
Newcastle Units	24/9—25/6	+–/6d.
Ditto 4 p.c. Deb. (x.d.)	99—101	May 1

OFFICIAL LIST

Cape Town 4½ p.c. Pref.	65/—85/–	+–5/–
Commercial Ord.	55—60	+2
Gas Light Units	20/6—21/6	+1/3d.
Ditto 3 p.c. Deb.	87—92	—
Imperial Continental	86—91	+1
Ditto 3½ p.c. Red. Deb.	97—100	+1
Montevideo Ord. (x.d.)	81—85	May 1
Primitiva Holdings Ord.	8/—10/–	+1/–
South Metropolitan Ord.	81—84	+1
Tottenham Ord.	112—117	+1

SUPPLEMENTARY LIST

Brighton 5 p.c. Deb.	117—122	+2
Newport (Mon.) 5 p.c. Deb.	115—120	+5

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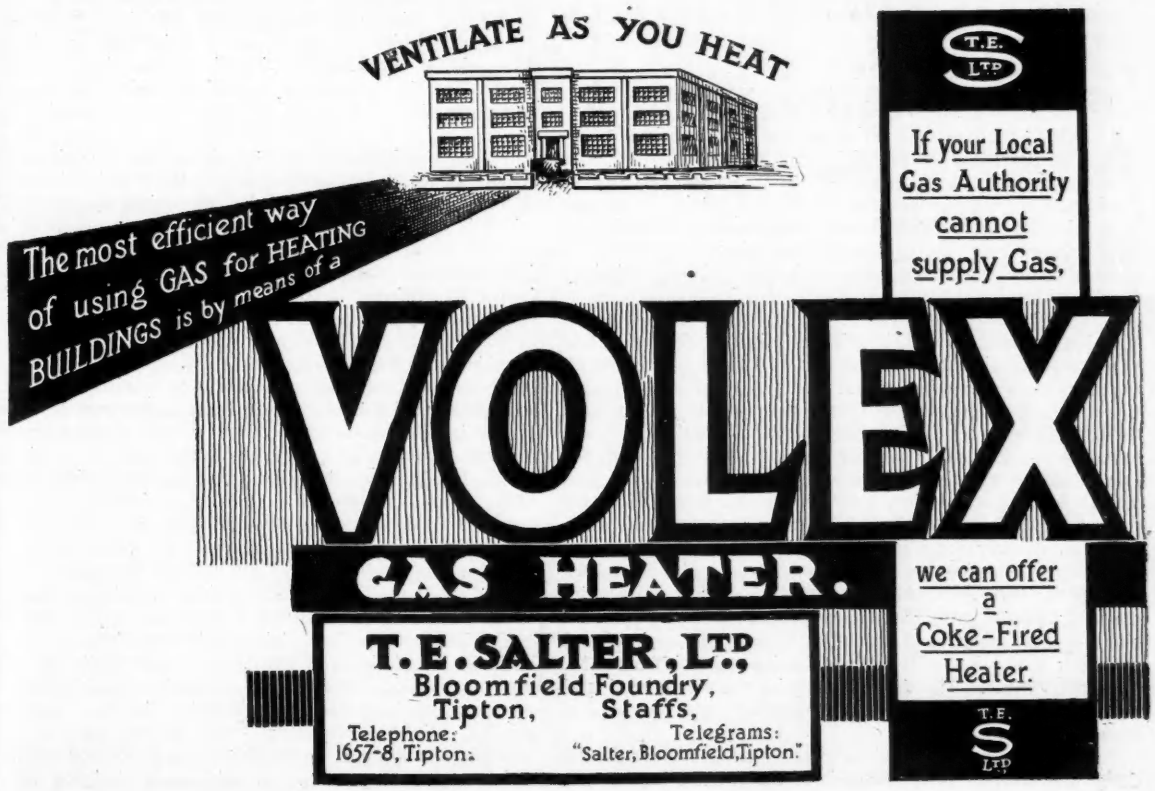
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